



Sternal Reconstruction and Omentoplasty after Mediastinitis

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Abstract

Deep sternal infections are serious complications after open heart surgery. We present a case of a 59-year-old female with uncontrolled diabetes who underwent aortocoronary bypass surgery in another cardiac surgery department. After the surgical intervention sternal dehiscence and wound infection occurred, which was followed by two unsuccessful attempts for sternal refixation. Two months after the initial procedure the patient was admitted to our institution with severe dyspnea and paradoxical movement of the thorax. Computed tomography revealed a huge defect of the sternum and metal osteosynthesis with a titanium plate and omentoplasty was performed. The patient was followed-up for one year with excellent postoperative result.

Keywords

computed tomography, metal osteosynthesis, sternal dehiscence

INTRODUCTION

Deep sternal wound infections represent a serious complication after open heart surgery and are directly related to both short-term and long-term survival. They are associated with higher mortality and morbidities, prolonged hospital stay, and increased patient suffering and cost.¹ Despite the advance in prophylaxis, their incidence remains significant - 0.5 - 6.8%.² The associated in-hospital mortality ranges from 7% to 35%.³ Wound complications occur predominantly after coronary artery bypass grafting procedures (CABG) and authors report 15% difference in 1-year survival rate among patients who developed deep wound infection and those who did not.^{4,5}

CASE REPORT

We present the clinical case of a 59-year-old female with uncontrolled diabetes on insulin therapy for 15 years, who

underwent CABG procedure in another cardiovascular center. The closure of the sternum was done using the traditional wire cerclage method. In the early postoperative period, sternal dehiscence and deep wound infection occurred, which required prolonged antibiotic treatment and vacuum-assisted wound therapy. Sternal rewiring was performed after two negative microbiological wound samples were achieved. The patient was readmitted 10 days after hospital discharge with severe sternal reinfection, which required another rewiring. Two months later she was admitted to our department with chest pain, severe dyspnea and peripheral edema. Physical examination revealed chest wall instability and a fibrous nonunion of the chest wall and sternum. Laboratory investigations were completely normal except for the serum glucose (34 mmol/l). ECG demonstrated sinus rhythm and left bundle hemi-block. Transthoracic echocardiography revealed concentric left ventricular hypertrophy with normal ejection fraction. Computed tomography (CT) demonstrated severe chest bone destruction due to deep sternal infection (Figs 1-5). Ribs were also affected.

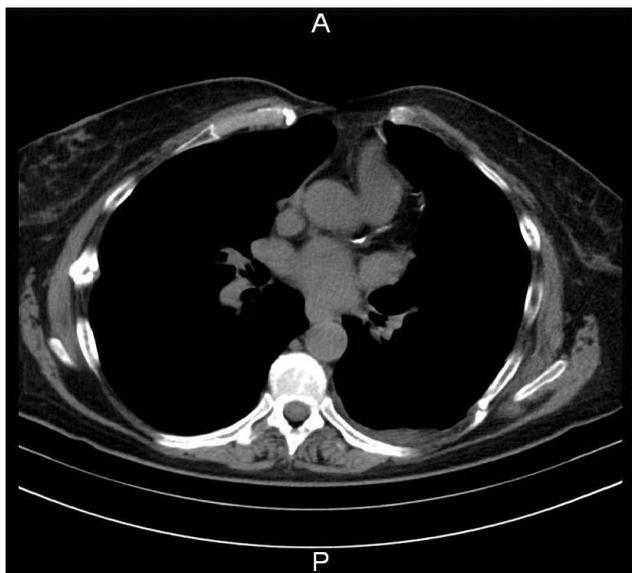


Figure 1

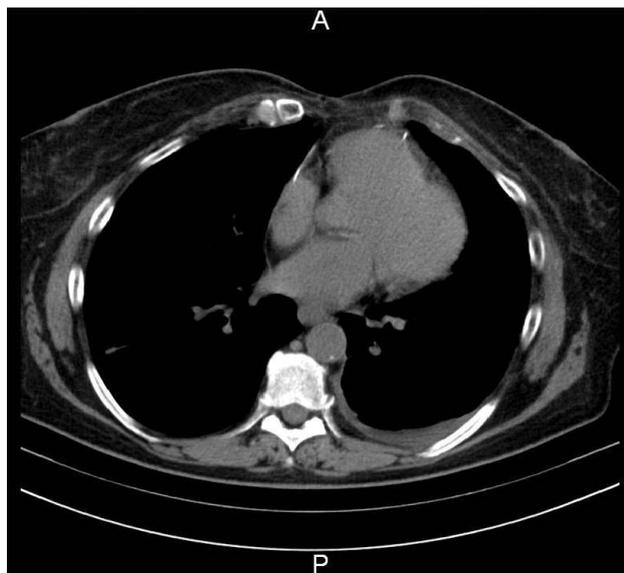


Figure 3

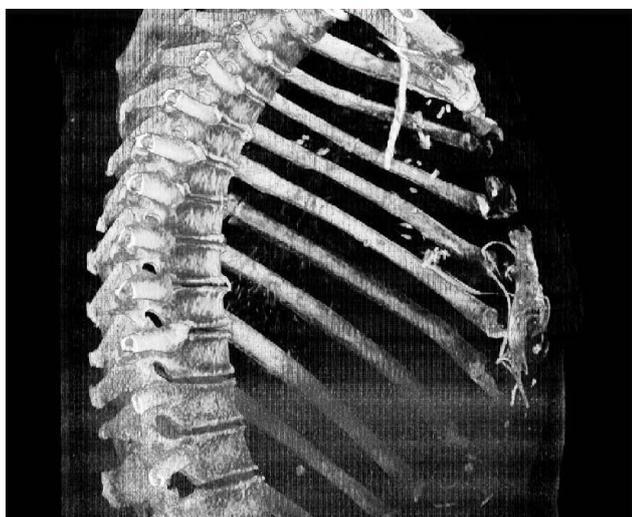


Figure 2



Figure 4

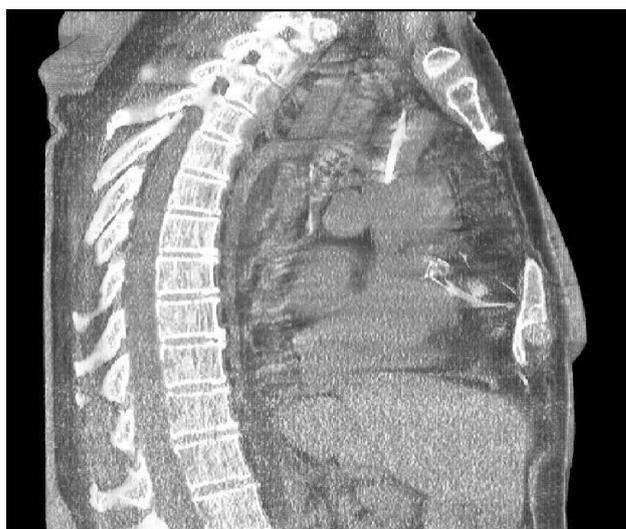


Figure 5

Figures 1-5. Preoperative CT. The chest bone is severely destroyed due to osteomyelitis – deep sternal infection. Ribs are affected.

Based on these findings, the patient required removal of the scar and chest wall stabilization using internal hardware with titanium plate and an overlying omental flap.

Surgical intervention

The two pectoral muscles along with the underlying tissue were lifted to the level of the medioclavicular line in order to represent both ends of the sternum and the ribs and a titanium plate (Geister® Sternal Fixation System, Germany) was positioned and secured with steel wires. Upper-medial laparotomy was performed for mobilization of omentum majus in order to cover the residual defect (Figs 6, 7). The surgical wound was sutured using polyamide non-resorbable sutures.

Post-operative period was uneventful. The patient was extubated 3 hours after the intervention and the drainage was removed on postoperative day 1. During the hospital stay, the patient had no evidence of surgical wound infection and was discharged on postoperative day 10 in good health with recommendations for adequate glycemic control. Long-term follow-up showed a stable sternum and no chest symptoms.

DISCUSSION

Studies have shown that risk factors of deep sternal wound infections post cardiac surgery include prolonged intubation, bilateral internal mammary arteries use, diabetes, post-op bleeding, high body mass index and combined surgery.¹ Wound complications include sternal instability (movement of the sternum at the site of sternal division), dehiscence (re-opening of the wound at the site of the sternal division), and mediastinitis.⁶ The standard closure technique after median sternotomy is to join the two sternal edges using steel wires. However, this closure technique has been associated with several serious complications that have prompted surgeons to study new closure methods. Simple rewiring or the Robicsek's technique often fails to achieve sternal healing and stability due to poor sternum quality. Failed rewiring can lead to partial or complete sternum removal and consequent sternal defects.⁷ The rate of rewiring failure can be as high as 45%.⁸ Reconstruction of the chest wall with titanium plate or titanium fixators in cases of severe osteomyelitis and large sternal defects, as in our case, is an excellent and safe alternative in case of sternal dehiscence.⁹ Multiple case series studies have demonstrated good clinical outcomes with titanium plates fixation.¹⁰ A retrospective study compared titanium plate fixation versus conventional closure for sternal dehiscence after car-

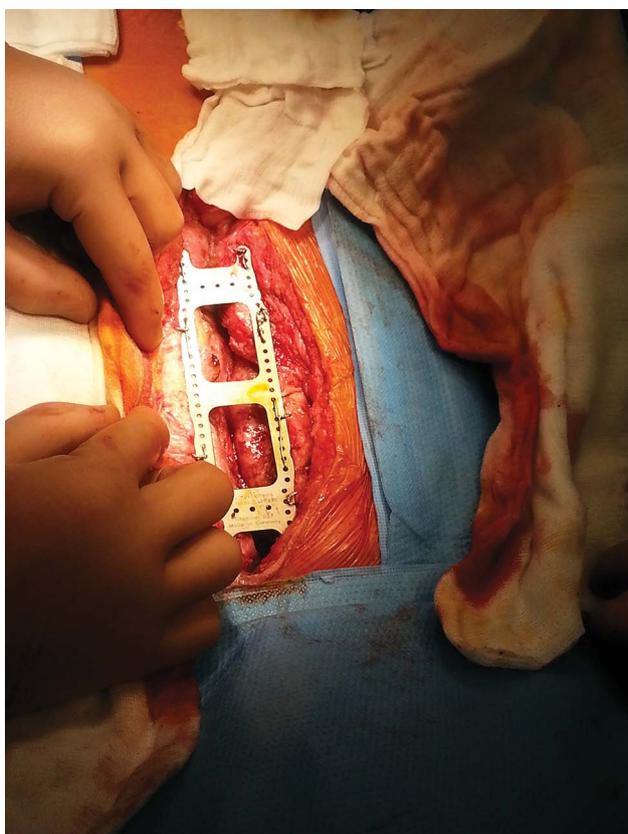


Figure 6. Titanium sternal fixation plate is positioned and secured with steel wires.

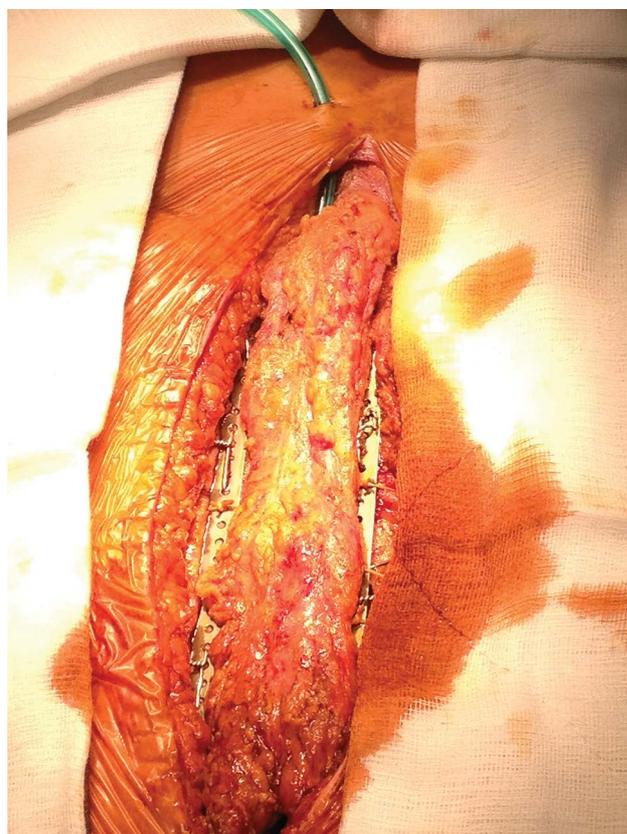


Figure 7. Residual space is filled with pedicled omental flap.

diac surgery and showed that titanium plate fixation was superior in stabilizing the sternal bone when compared to conventional re-fixation methods.¹¹ The titanium plate provides stability to the chest wall and significantly reduces the tension on the surgical wound, which leads to faster and safer healing. When the chest wall is stabilized properly, it is fully involved in the process of breathing and the tidal volume of the lungs increases, which improves the quality of life.¹² Another advantage is that specialized equipment and instruments are not required in order to perform the intervention. CT is of great importance as a basic diagnostic tool in cases of deep sternal infections. Moreover, the surgeon chooses the proper operative technique according to the CT findings.

CONCLUSIONS

Titanium plate fixation combined with appropriate debridement and flap interposition is very effective for the treatment of sternal dehiscence following major cardiac surgery. Our case with an excellent outcome supports the current literature that sternal plate fixation is an effective and safe approach for secondary closure.

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Реконструкция грудины и оментопластика после медиастинита

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Резюме

Глубокие инфекции грудины – серьёзные осложнения после операции на открытом сердце. Мы представляем случай 59-летней женщины с неконтролируемым диабетом, которая перенесла операцию по установке шунтирования коронарной артерии в другом отделении сердечно-сосудистой хирургии. После операции развилось расхождение грудины и инфекция раны, за которыми последовали две неудачные попытки рефиксации грудины. Через два месяца после первичной процедуры пациент был госпитализирован в наше лечебное заведение с острой одышкой и парадоксальными движениями грудной клетки. Компьютерная томография показала огромный дефект грудины, был произведён остеосинтез с применением титановой пластины и оментопластики. Пациент наблюдался в течение одного года с отличными послеоперационными результатами.

Ключевые слова

компьютерная томография, металлоостеосинтез, расхождение грудины
